Work Instruction

DIRECTIVE NO.	303-WI-7120.1.2A	**APPROVED BY Signature:**	*Original signed by*
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EXPIRATION DATE:	January 26, 2010	**TITLE:**	Chief, AMO

COMPLIANCE IS MANDATORY

Responsible Office: Code 303 / Assurance Management Office

Title: Software Quality Assessment Process

PREFACE

P.1   PURPOSE

This work instruction provides an overview and guidelines to Software Quality (SQ) personnel for conducting process and product assessments. This includes five phases: 1) assessment planning, 2) conducting the assessment, 3) assessment reporting, 4) follow-up assessment, and 5) tracking and escalation.

P.2   APPLICABILITY

This work instruction applies to all OSSMA Quality personnel.

P.3   REFERENCES

a. 303-PG-7120.2.1, Procedure for Developing and Implementing Software Quality
b. 303-WI-7120.1.1, Software Quality Reporting Process
c. 303_FRM_RPT1, Software Quality Reporting Form
d. Software Quality Assurance Audits Guidebook, SMAP-GB-A301
e. Sample Assessment plans, checklists, and reports on the GSFC Software Assurance web site: http://sw-assurance.gsfc.nasa.gov/
f. NASA Lessons Learned Information System (LLIS) web site: http://llis.nasa.gov
g. Site for On-line Learning and Resources (SOLAR) web site: https://solar.msfc.nasa.gov/

P.4   CANCELLATION

303-WI-7120.1.2, Software Quality Assessment Process

P.5   TOOLS, EQUIPMENT, AND MATERIALS

For each SQ process and product assessment, SQ personnel shall require applicable standards, procedures, checklists, reporting forms, and Microsoft Office tools. Depending on the scope of the assessment, one or

more of the following will be needed: access to the project server, project risk management system, supplier software asset/artifacts repositories, and the web-based NASA Lessons Learned Information System (LLIS).

P.6   SAFETY PRECAUTIONS AND WARNINGS

N/A

P.7   TRAINING

Software Quality personnel shall have fundamental knowledge in auditing techniques. Training options include ISO Auditor training, the American Society for Quality (ASQ) Quality Auditor Primer, and the "Audits and Reviews" course offered on the Site for On-line Learning and Resources (SOLAR) web site.

P.8   RECORDS

Record Title	Record Custodian	Retention
SQ Assessment Report	Software Quality personnel	*NRRS 8/36.5C1- Handle as permanent pending retention approval.
Completed Checklists and assessment artifacts	Software Quality personnel	*NRRS 8/36.5C1- Handle as permanent pending retention approval.
SQ Reporting Form (completed)	Code 303, Software Assurance Lead	*NRRS 8/36.5C1- Handle as permanent pending retention approval.

NRRS – NASA Records Retention Schedule (NPR 1441.1)

P.9   METRICS

SQ personnel are responsible for generating and maintaining project level metrics based on assessment results:

a.   Number of SQ Assessments (Planned vs. Actual)

b.   Number of SQ Assessment Findings

c.   Number of SQ Assessment Findings by Priority Level

d.   Number of SQ Observations

e.   Number of SQ Findings open > 60 days (Aging Report)

f.   Number of Risks identified as a result of the SQ assessment

P.10   DEFINITIONS

a.   Finding – Non-compliance to a requirement, procedure, standard, or specification.

b.   Observation - A statement of fact (positive or negative) based on objective evidence.

c.   Priority 1 Finding - A major omission or non-compliance that requires immediate attention and corrective and preventive action, as well as SQ follow-up. Failure to correct may impact the development life cycle or the integrity of the product.

d.   Priority 2 Finding - A minor omission or non-compliance that does not jeopardize the immediate quality of the process or product, but requires timely corrective and preventive action. SQ follow-up is also required.

e.   Process Assessment – A systematic examination to determine whether a software process is being performed in accordance with documented plans, procedures, etc.

f.   Product Assessment – A systematic examination to determine whether a software product meets specified requirements and standards.

g.   Waiver – A written authorization to accept a configuration item or other designated item which, during production or after having been submitted for inspection, is found to depart from specified requirements, but is nevertheless considered suitable for use as is or after rework by an approved method.

INSTRUCTIONS

In this document, a requirement is identified by "shall," a good practice by "should," permission by "may" or "can," expectation by "will," and descriptive material by "is."

Overview

Software Quality is the planned and systematic approach for evaluating the quality of and adherence to software product standards, processes, and procedures. It entails reviewing all software development products and related processes to ensure that they meet a predefined set of requirements, standards, and procedures. SQ assessments are based on the processes and products defined in the developer's Software Management Plan (SMP), as well as contractual deliverables, and identified reviews.

For a summary of software process and product assessments typically performed during the development and maintenance of software, refer to Tables 4.2-1 and 4.3-1 in the Procedure for Developing and Implementing Software Quality, 303-PG-7120.2.1.

The five assessment phases described below are general guidelines to be used in planning, conducting, reporting, and providing assessment follow-up. Software Quality personnel plan the processes and products to be evaluated and establish the assessment scope based on contractual requirements, the project life cycle phase, and/or perceived areas of risk.

The project's Software Quality Assurance Plan (SQAP) details the software quality (SQ) assessments planned for each NASA mission supported by the Assurance Management Office (AMO), Code 303. The SQAP is developed and maintained by the Systems Assurance Manager (SAM) and Software Quality personnel assigned to the project.

Assessment Plan (optional)

SQ personnel shall develop an Assessment Plan for assessments that entail a broad scope or assessments conducted at external provider facilities. Examples include a first time assessment of a provider's configuration management system or an assessment of a provider's compliance to their SMP. Plans are also recommended for assessments where nonconformances are known to exist or a high-level of risk is perceived. While assessment plans serve to define and document a planned assessment, they are not required for follow-up assessments or ad-hoc inspections.

At a minimum, the following information shall be included in an Assessment Plan: the purpose and scope of the assessment, assessment dates and locations, contact information for the assessment team, support requirements, assessment activities, and the reporting approach. For sample Assessment Plans, go to the GSFC Software Assurance web site http://sw-assurance.gsfc.nasa.gov/.

Input Data-Gathering and Review

Software Quality personnel shall gather and review applicable contractual documents, Contract Data Requirements List (CDRL) items, NASA standards and requirements, and project standards, procedures, recent status reports, risk reports, and documented nonconformances. In addition, SQ personnel shall download, tailor, and use SQ checklists located on the GSFC Software Assurance web site. SQ personnel shall tailor the checklists to meet specific requirements of the NASA mission and software development effort.

SQ personnel shall notify the project at least one week in advance of a scheduled assessment. The actual timing of assessments is based on the SQAP, the Project Plan and the project schedule.

Conducting the Assessment

An entrance briefing (also known as an in-brief) shall be required for broad assessments or assessments conducted at external provider facilities. The entrance briefing shall address the following information: clarifications regarding the assessment scope, assessment confidentiality, availability of supporting evidence, planned interviews, length of the assessment, any plans for daily wrap-up sessions, and the exit briefing and final assessment report.

Assessments shall be conducted using one or both of the following assessment techniques: interviews and examination of objective evidence (i.e., design documentation, development folders, etc.). For process assessments, the focus of the evaluation is on how well the process is being adhered to and not the competency of the individual(s) who perform the process.   For product assessments, the emphasis is on product compliance to requirements and/or specifications.

The scope of the assessment and the required assessment time shall reflect the desired completeness of coverage, as well as depth of examination. Sample sizes and the selection methodology should be based on the type of coverage required and the amount of assessment data needed to provide an objective and comprehensive evaluation.

When a finding or observation is identified, SQ personnel shall gather and document objective evidence and any other artifacts to support their claim. This information shall also be discussed with the interviewee or assessment escort (if available) in order to substantiate the preliminary finding and reach a mutual consensus on its priority.

Assessment Reporting

SQ personnel shall report the assessment results at the conclusion of the assessment. The assessment report shall document the results of the assessment and provide the SAM, Project Management, and Process/Product owners the details of the assessment. At a minimum, the assessment report shall include background data, assessment input data, results from the assessment (findings/observations/risks identified), and any recommendations. The assessment report shall also include information on follow-up assessments, if required. It is recommended that assessment reports be finalized and distributed within 2 weeks after assessment completion. For sample Assessment Reports, go to the GSFC Software Assurance web site. The assessment report shall be sent to the NASA GSFC Software Assurance Lead in the Assurance Management Office (AMO), Code 303.

If an entrance briefing was conducted at the beginning of the assessment period, it is expected that an exit briefing (also known as an out-brief) be conducted at the conclusion of the assessment and just prior to the development of the assessment report. The exit briefing shall include the raw data (i.e., initial results and adjusting results) collected from the assessment, a summary of objective evidence, and the number and priority of findings and observations. In addition, SQ personnel shall communicate the estimated time frame for corrective action on any open findings.

Within 5 business days of the completed assessment, SQ personnel shall also complete a Software Quality Report Form for the purposes of Software Assurance metrics.   The SQ Reporting Process Work Instruction and associated SQ Report Form are located in the Goddard Directives Management System (GDMS), as well as on the GSFC Software Assurance web site. The Software Quality Report Form shall be sent to the NASA GSFC Software Assurance Lead in the Assurance Management Office (AMO), Code 303.

Follow-up Assessment

A follow-up assessment is required to verify corrective action and to close SQ assessment findings, as documented in the final assessment report. The follow-up assessment ascertains the status of the action taken by the project (i.e., process or product owner) as the result of identified preventive and/or corrective action. Closure of all corrective actions resulting from a follow-up assessment shall be documented in an assessment report, as well as captured in the Software Quality Report Form.

The frequency and timeframe of the follow-up assessment shall be determined by the criticality of the finding and its impact to the development life cycle and/or critical milestones. Follow-up assessments to product findings typically occur closer to the original assessment to ensure timely corrective action. Follow-up assessments to process deficiencies can occur multiple times throughout the project life cycle to ensure process compliance and continuous process improvement.

Tracking and Escalation

SQ personnel shall maintain a repository of all open/closed findings for tracking, trending, and escalation purposes.

Tracking

A Tracking repository shall be developed by SQ personnel and used to track and status assessment findings. The tool used for the tracking repository shall have the ability to graph the data for trending, highlight aging of open reports, and other status reporting, as needed.

The Tracking Repository shall have, at a minimum, the fields listed below:

    a. Finding Number
    b. Project Name or subsystem
    c. Date of Finding
    d. Priority Number (P1 – Major, P2 – Minor)
    e. Finding Description
    f. Status *(See field state below)*
    g. Assigned To (Project Personnel)
    h. Date of Corrective Action (Planned Implementation)
    i. Date of Follow-up
    j. Date Closed
    k. Escalation Path *(See field states under section on Escalation)*
    l. Comment Field

SQ personnel shall use the "Status" field in the Tracking Repository to record the current status of the finding. The Status field has the following states:

States	**State description**
Open	SQ has reported finding to Project and is awaiting corrective action
Awaiting Approval	Project has responded with acceptable corrective action or wavier
Closed	SQ personnel has verified the corrective action or approved wavier

Escalation

SQ personnel shall use the Escalation Path field to record what actions have been taken to close the finding. The Escalation Path field has the following states:

States	**State Description**
0	No escalation required. The finding has been reported to the SAM and the Project via the assessment report. Corrective action planning or implementation is underway.
1	Issue has been escalated to the SAM and the Project Manager/Software Development Lead. Process/Product owner has 1) not communicated their corrective action plan within 5 working days of assessment completion or 2) implemented corrective action per agreed upon schedule.
2	Issue has been escalated to Code 300 if 1) delay in corrective action is impacting cost, schedule, safety, or quality or 2) corrective action is considered time-critical and warrants immediate attention. In the case of #2, the issue is escalated to the SAM and the Project, as well as Code 300.

All Priority 1 findings in State 2 shall be reported to the Office of Systems Safety and Mission Assurance, Code 300, via the SAM Monthly/Quarterly presentations. The escalation process is reserved for Priority 1 findings; however, a priority 2 finding can be elevated to a Priority 1 if the finding is not addressed and impedes the quality of the process or product over time.

CHANGE HISTORY LOG

Revision	Effective Date	Description of Changes
Baseline	07/07/2004	Initial Release
A	01/26/2005	Updated template, removed non-requirements, and revised for clarity